Augmented Public Transit: Integrating Approaches to Interface Design for a Digitally Augmented City

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Abstract. The contemporary body is a connected body that can instantly access home, work, leisure, and information via rapid mobility and communication networks, a "tethered" body as Sherry Turkle would put it. The ever-intrusive reach of technology into our social and physical environments and our bodies has given birth to the idea of the cybernetic organism (cyborg) or post-human (Hayles, 1999). In the discipline of Architecture the cyborg has provoked wild speculation and disembodied fantasies, yet little attention has been given to the micro realities of digital interfaces and to the discipline of user centric design, or to the empirical study of vast interactive information systems already in place across the urban environment. This paper will argue that integrated approaches between architecture, interaction design and other disciplines are key to meaningful interventions within an augmented urban environment. This argument will be illustrated by a recent interface design project dealing with usability and public transit, conducted at the Knowledge Media Design Institute at the University of Toronto.

Keywords: Interface design, Architecture, portable information, public transit information systems.

1 Introduction

Mobile technology has proved to be a powerful means for extending the subject's domestic sphere into the public domain and vice versa. Given the complex and contested relationship between public and private realms, Architects and designers often face the complex question of how to intervene in a way that is both meaningful and responsive to user's needs. One approach would be to engage readily available technologies such as the PC and the mobile phone and to establish new connections with existing urban information systems. Rather than focusing on novel concepts that require both new technology and new ways of gathering and accessing information, urban designers, architects and interface designers could collaborate on opening up existing datasets of information latent within urban systems to the individual user interface. This very approach was used in a recent project: Toronto Transit Commission (TTC) Trip Planner and User Profile. Our team designed and tested an online trip planner and user profile designed to improve the information gathering experience of users, which would thus

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decrease users' uncertainty of schedules, routes and wait times for user of public transit in Toronto. Central to this project was the idea of public Transit as an urban interactive information system connecting a central website/database of transit information to public interfaces such as bus stops, and private interfaces such as personal computers and mobile devices. The project was developed using questionnaires, iteration of high and low fidelity prototypes and current usability testing methods.

2 TTC Trip Planner and User Profile

The Toronto Transit Comission (TTC) Trip Planner and User Profile is the product of an interface design challenge addressing the issue of sustainable transportation. We targeted a young professional demographic living in the central core of the city as the end-users of this interface. The only requirement was that they be non-students between the ages of 19-44. We reasoned that this demographic would be the most likely to be making long-term decisions on means of transportation (i.e. purchasing an automobile versus using public transit or a bicycle). We created an online survey to gather information regarding the use of public transit by the target end-users. An important finding of this survey was that the TTC website was the primary source of information in planning unfamiliar journeys. Secondly, the questionnaire demonstrated that users were discouraged by the lack of comprehensive information regarding schedules and wait times, resulting in an overall feeling of uncertainty when using the system.

The group brainstormed a series of possible scenarios responding to the issue of uncertainty. The final sketch illustrated a GPS based vehicle information system that is accessed via three interfaces: web, PDA, and interactive bus stops. This diagram demonstrated the potentially expansive scope of the project and recognized that the existing GPS technology of the TTC's vehicles can be accessed through various information interfaces. The focus was consequently narrowed to one of the three suggested interfaces: a web-based trip planner. A review of current literature on the design of Trip-Planners helped guide our approach to the design of the interface. "Design of a Map-Based Transit Itinerary Planner" (Cherry, Hickman & Garg, 2006) provided a broad review of useful points regarding the design of a trip planner. Of particular relevance was the discussion on displaying graphical information and the importance of systems mimicking user decision-making processes. "Understanding the relationship between physical and virtual representations of transit agencies" (Yi, Rasmussen, & Rodrigues, 2007) provided additional context on transit website design in North America. It argues that the user's cognitive costs are reduced by good interface and design; i.e. if the user is only required to input minimal information and the system does the heavy cognitive lifting. The article argues that the time and effort saved by the user when searching for transit information on a website serves as an incentive to use public transit more frequently, which relates directly to the goal of this project. These insights helped refine the design of our low fidelity prototypes alongside diagrams describing the flow of tasks to be carried out.

The third low-fidelity prototype, similar to a website wire-frame, was used for Wizard of Oz testing. This version was designed with the intent to test two tasks: planning a trip and creating a user profile. The trip planner mimics a typical decision making process, and is modeled after airlines websites and other existing trip planners. The public Home Page of the Trip Planner is composed of three stages: (1) enter origin and destination; (2)

Refine search by travel method, time, walking time; (3) view search results. The Search Results page provides options that distinguish our prototype from currently existing solutions, namely a "save to my user profile," "send to text msg" and"send to PDA" functions. It was an important design goal to allow for the creation of a personal profile and to allow for the portability of query results via portable interfaces such as cell-phones and hand-held devices. The personal Home Page of this prototype included a field showing saved trips and travel warnings. The use of a personal profile would also allow users to save their PDA or cell phone number and store current location information via an IP address locator. This latter feature sets our prototype apart from other trip planners, such as the ones in place in Montreal and San Francisco.

The first high fidelity prototype, a website, was used to conduct a usability test with three end-users deemed representative of our target demographic. The testing was facilitated by the four members of the team, one serving as the computer, and three others as observers noting various aspects of the user reactions. Various aspects of the trip planner were static including pull-down menus in the Refine Search Results page as well as some radio buttons. Other functions such as the "send to pda," "send to text," "e-mail trip," and "locate me" via IP functions were included as buttons but were not fully implemented at this stage. This made the computer role a crucial one, requiring verbal prompting and guidance in the flow of some tasks. Moreover, this limited the scope of the usability test to tasks related to the core Trip-Planner and personal Home Page. The first task was designed to assess if users would enter the origin and destination via the Home Page or chose to create a Personal Profile and conduct this task within it. This task was also designed to evaluate the usability of the registration process. The second task focused on the user profile, with the objective being to evaluate the layout and organization of the information, including location and wording of icons and buttons. The tests lasted 20 minutes. One observer noted the body language as well as on-screen mouse movements, another observer noted the comments of the participants, and the fourth observer recorded the session on video in order to facilitate the transcription of comments.

The observations made during the usability tests provided insights into potential problems regarding the flow of the tasks vis-à-vis the decision making process of the user, and were therefore used to make changes to the visual organization and hierarchy of the Website interface. The design team felt that the TTC Trip Planner project met the requirements laid out in the initial proposal and that its design through iterative cycles and attention to user requirements and input produced a valuable and unique tool that could positively impact the use of sustainable transportation. Having addressed the Trip Planner web interface and its associated personal Profile, it was noted that the next possible steps in meeting the vision of an public transit information System could be the design of an integrated smart-phone application as well as integrated interactive bus stop information system. The methods of usability testing allowed us to evaluate how a fully functioning website could be implemented without investing heavily in full-functionality at the early design stage. Moreover, this approach, weighed more heavily towards Wizard of Oz techniques, proved manageable for a multidisciplinary team of Information Studies students and an Architecture student, all lacking the technical know-how to implement a fully working prototype. This method proved both economic in terms of time expended and technical resources. Its results can be seen as a tested and workable framework onto

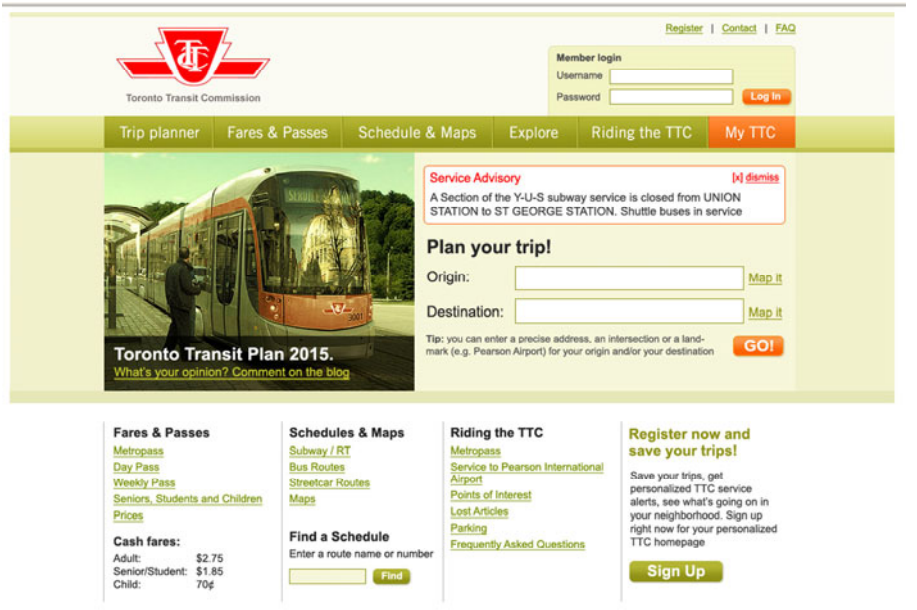

Fig. 1. Trip Planner Interface Home Page

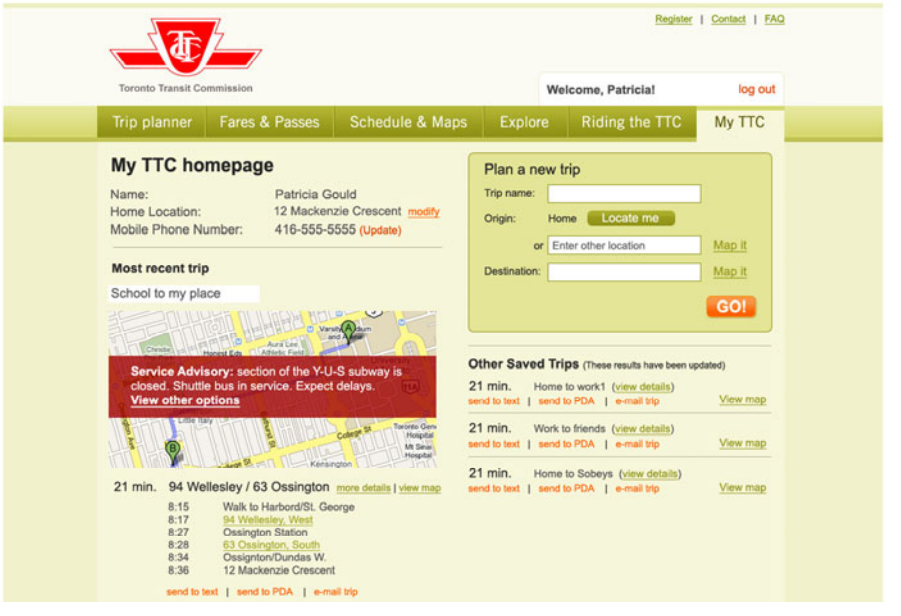

Fig. 2. TTC User Profile Page

which fully functioning features, particularly those regarding to data portability, can be subsequently incorporated.

3 Conclusion

This project is an example of how a multidisciplinary group can collaborate using the methods of user centric design to provide a more integrated and user-friendly public transit information system. The presence of different disciplines within the design team proved fruitful particularly in the brainstorming and research phases of the project. It is at this stage that potentially innovative approaches were identified, in this case that of an umbrella public transit information system that is accessible through a range of information interfaces public and private, stationary and portable. Information is not an elusive ether of 0's and 1's that is independent of its context. Rather, information is embedded in a temporal, spatial and cultural environment of distributed cognition, which we access and contribute to in a myriad of ways. This type of work poses a unique multidisciplinary approach to Interface Design research that considers information as a spatial-temporal phenomenon engaged in a feedback loop with humans wielding technological prostheses, one that can also be embedded and accessed in urban spaces.

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